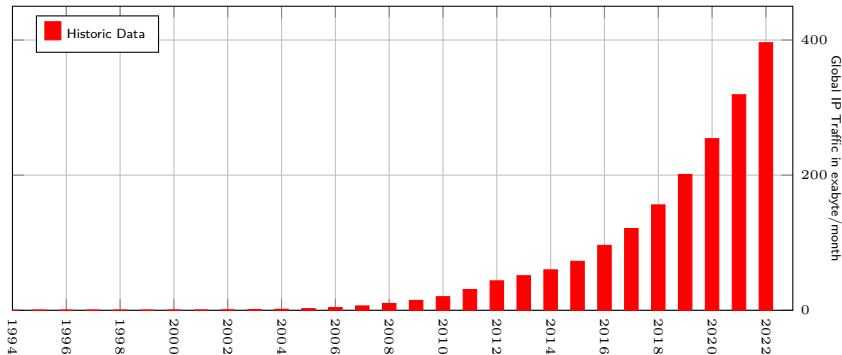# Communication Theory (5ETB0)
Module 1.2

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Course Motivation (1/4)

Global IP traffic per year according to the Cisco virtual networking index in exabyte/month (1 exabyte=10^{18} byte).

- Wireless (WiFi, 4G, DVB), wired (coax, twisted pair), fiber optics, etc.
- Study underlying theory and principles behind the global telecomms infrastructure

Course Motivation (2/4)

**iCAVE Project: Embedding Digital Communication in Car Radars**

Context:
Vehicle-to-Vehicle (V2V) communication and automotive radars are expected to play a strategic role in improving driving safety in future intelligent transportation system (ITS).

The Project:
How can we modify the waveforms use in radar so that they can also be used to transmit information between cars?

Required Knowledge:
Digital communications, modulation, detection theory, etc.

A. Alvarado
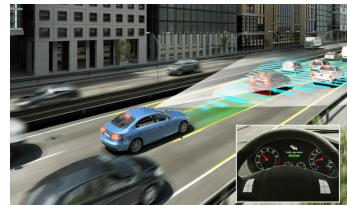
FUN-NOTCH: Fundamentals of the Nonlinear Optical Channel

Context:
Fibre optics are critical infrastructure for society because they carry nearly all the global Internet traffic.
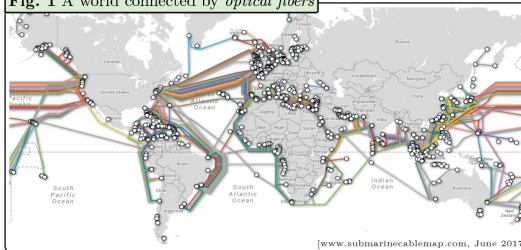
The Project:
Find the maximum amount of information that optical fibres can carry in the highly nonlinear regime and design transceivers well-suited for this regime.

Required Knowledge:
Digital communications, information theory, error correcting codes, etc.

Fig. 1 A world connected by *optical fibers*

[www.submarinecablemap.com, June 2017]

Course Motivation (4/4)

Historic Perspective

Discipline				
Telegraphy and Telephony	Wireless Communications	Electronics	Modulation Methods	Fundamentals
Volta, 1800 Oersted, 1819 Henry, 1827 Morse, 1838 Graham Bell, 1875 Pupin, 1900	Faraday, 1831 Maxwell, 1873 Hertz, 1886 Branly, 1890 Popov, 1896 Marconi, 1901 Pierce, 1955	Braun, 1874 Fleming, 1904 DeForest,1906 Bardeebm Brattain, Shockley, 1948 Kilby, Noyce, 1958	Campbell, 1909 Armstrong, 1915-1918 Bijl, Hartley, Heising, 1915 Carson, 1915	Nyquist, 1924 Hartley, 1928 Reeves, 1938 Dudley, 1939 Wiener, 1942 **North, 1943** Kotelnikov, 1947 **Shannon, 1948**

- North invented the matched filter
- Shannon is known as "the father of information theory"
- More details in Chapter 1 of the reader
- A (relatively speaking) new field

Summary Module 1.2

Take Home Messages

- Theory behind digital data transmission
- Exciting field with many interesting applications

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